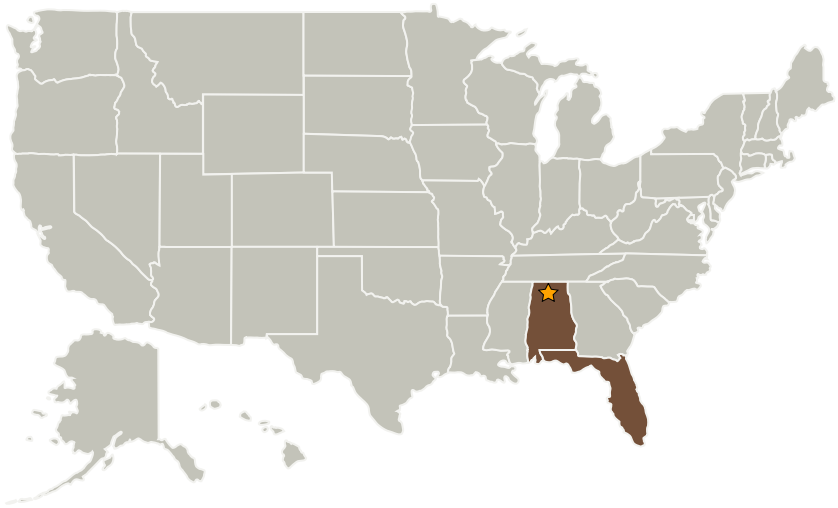
Physics-Based Pneumatic Hammer Instability Model, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

Florida Turbine Technologies (FTT) proposes to conduct research necessary to develop a physics-based pneumatic hammer instability model for hydrostatic bearings operating in a compressible fluid. The innovation of the resulting model is to account for the extreme density, compressibility, and non-uniform pressure variations found in highly turbulent rocket engine liquid hydrogen turbopump hydrostatic bearings as well as the variations resulting from 3-D effects such as tangential and/or axial injection, which are ignored in the pneumatic hammer instability criteria currently used throughout industry. The ability to accurately predict the stability of highly turbulent, highly compressible liquid hydrogen hydrostatic bearings incorporating 3-D effects is essential for NASA to achieve IHPRPT objectives through the use of smaller, faster turbopumps. This project will enable the accurate prediction of bearing stability, resulting in higher performing bearings that enable smaller operating clearances for improved turbopump and system-level performance.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Florida Turbine Technologies, Inc.	Supporting Organization	Industry	Jupiter, Florida

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Alabama	Florida

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.7 Mechanism Life Extension Systems